DOCUMENTS EXPEDITING PROJECT 25

[COMMITTEE PRINT NO. 3]

RELATIONSHIPS OF RIVER AND RELATED WATER RESOURCE DEVELOPMENT PROGRAMS OF UNITED STATES, SOVIET RUSSIA, AND (RED) CHINA

SUPPLEMENTAL MEMORANDUM

OF THE

CHAIRMAN

TO MEMBERS OF THE

SENATE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

TOGETHER WITH AN ADDENDUM FROM

HON. HENRY M. JACKSON, OF WASHINGTON

(In Connection With S. Res. 248 of the 85th Congress)

FEBRUARY 17, 1958

Printed for the use of the Committee on Interior and Insular Affairs

UNITED STATES
GOVERNMENT PRINTING OFFICE
21490 WASHINGTON : 1958

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MEMORANDUM OF TRANSMITTAL

UNITED STATES SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
February 11, 1958.

To Members of the Committee on Interior and Insular Affairs:

Attached is a letter to me from our colleague, Senator Henry M. Jackson, of Washington State, relating to his visit to the Soviet Union and his observations with respect to its progress and plans to overtake the United States industrially.

I am especially impressed with Senator Jackson's observations on the progress the Soviet Union is making in installing hydroelectric plants that exceed the capacity at any dam in the United States.

At Senator Jackson's request, the Library of Congress has prepared a study from Soviet sources of Soviet activity in the field of power generation.

I consider Senator Jackson's personal observations on his visit to Soviet Russia and the material from the Library of Congress a major contribution to the review of the relationship of water development programs of the United States and Soviet Russia. This review is being conducted jointly by our committee and the Committee on Public Works at hearings opening Monday, February 17, at 10 a. m. in room 224, Senate Office Building, with Senator Joseph C. O'Mahoney, of Wyoming, presiding.

In the meantime, I am having a committee print made of Senator Jackson's letter and the report of the Library of Congress in the form of an addendum.

JAMES E. MURRAY, *Chairman.*

LETTER FROM SENATOR JACKSON

FEBRUARY 11, 1958.

Hon. JAMES E. MURRAY,
Chairman, Interior and Insular Affairs Committee,
United States Senate, Washington, D. C.

MY DEAR MR. CHAIRMAN: A little more than a year ago, I visited the Soviet Union. I was struck with the determination of the Soviet leaders and their people to overtake the United States, industrially. Their boasts that they would accomplish this by the mid-1970's at first sounded hollow. But after my presputnik tour through thousands of miles of the Soviet Union I was impressed with the evidence of great progress.

Particularly impressive was the Soviet advance in the field of hydroelectric power—one of the vital bases for industrial growth and strength. I personally inspected a dam at Stalingrad on the Volga River which, when completed in the near future, will have a generating capacity of 2,310,000 kilowatts—considerably greater than our own Grand Coulee Dam.

Not far away and already in operation at Kuibyshev on the Volga is another dam larger than Grand Coulee. This dam's 2,100,000 kilowatts makes it—temporarily—the world's largest single producer of hydroelectric power.

Russian citizens and engineers to whom I talked were modest about these dams. For at Bratsk, on the Angara River in Siberia, the Russians in 1955 started to build a dam of 3.6 million kilowatts capacity. And at Krasnoyarsk on the Yenisei River in Siberia, they have underway a dam of 4 million kilowatts capacity—double Grand Coulee.

This is only a partial story of Soviet strides in developing the hydroelectric base that they need to make good their boast to catch up with us industrially in the next 20 years. Because I think it important that we know the full story, I have had the Library of Congress prepare—from Soviet sources—a thorough study of Soviet activity in the field of power generation. I respectfully request that this material be published as a committee print in order that these facts may have the widest possible distribution among the Members of Congress and the public.

Sincerely yours,

HENRY M. JACKSON,
United States Senator.

REVIEW BY LEGISLATIVE REFERENCE SERVICE, LIBRARY OF CONGRESS

RIVER DEVELOPMENT IN THE U. S. S. R.

(A review of recent information)

The water resources of the Soviet Union are currently undergoing development at an accelerated pace. Large-scale hydrotechnical installations are at present under construction on several of the major rivers of the country, from the Dnieper in the Ukraine to the Angara River in eastern Siberia. In this drive to step up the exploitation of the domestic water resources, the emphasis, as may be expected, is on increasing the supply of electric power for industry. Within the past 5 years, the network of hydroelectric power stations has increased its power generative capacity at an average rate of over 1 million kilowatts a year. Simultaneously, as a byproduct of the power program, the Soviet economy is now acquiring substantial new facilities for irrigation and improved navigation routes. One measure of the scale of current river development is the fact that it now consumes some 4 percent of the very substantial capital investments devoted annually by the U. S. S. R. to the expansion of the domestic economy as a whole.

THE POWER EXPANSION PROGRAM

The bulk of the electric power produced in the U. S. S. R., some 70 percent of the total, is consumed by industry. In the main, the power industry has been able, in the past, to meet the demands placed upon it largely by means of expanding the kilowatt capacity of its thermal power stations. In the attempt to keep pace with the needs of the country's expanding industry, however, the facilities for power production have always been operating under severe strain, with little margin for reserve, despite their continued expansion. The contribution of the hydroelectric stations has, until recently, been quite limited. In 1955, for example, the hydrostations accounted for some 16 percent of the country's power-generating capacity, about the same percentage as in 1950.

During the two decades before World War II, the Soviet Union went about the task of developing its waterpower potential at a rather slow rate. The stations erected then, by and large, served the purpose of supplementing the power supply of nearby industrial centers. The one conspicuous example of integrated waterpower development was the modern dam built in 1931, with the aid of American engineers, at Zaporozhe, on the Dnieper River. This installation, the largest of its kind in Europe, in time became the center of a sizable complex of industries, including aluminum, fertilizers, and electric steel. The exceptional position of this power station in the Soviet power picture

is shown by the fact that at the end of the prewar period, in 1940, it accounted for 35 percent of all the installed hydropower capacity in the U. S. S. R.

With regard to the utilization of hydroelectric power, therefore, the Soviet Government fell far short of achieving the goals originally set by Lenin in 1920. Under Lenin's 15-year power development program, known as GOELRO, which he considered basic to the modernization of the Soviet economy, special emphasis was to be placed on hydroelectric capacity. It envisioned an electric power structure in which, by 1935, waterpower would account for 37 percent of total available capacity. While the target for power expansion as a whole was attained, by the end of the period its hydroelectric component was seriously underfulfilled. Only 13.3 percent of all electric power capacity came from waterpower at the end of the 15-year period, namely in 1935. By 1940, the hydrostations still accounted for only 14.2 percent of the total power capacity of the U. S. S. R.

TABLE I.—*Capacity of Soviet electric power stations, total and hydro*

[In millions of kilowatts]

	All stations	Hydroelectric stations	Share of hydroelectric percent
1935	6.3	0.8	13.3
1940	11.2	1.6	14.2
1945	11.1	1.3	11.7
1950	19.6	3.2	16.3
1955	37.2	6.0	16.1
1956	42.8	8.4	19.6

Source: Electricheskie Stantsii, 11. 1957, pp. 12, 16.

Since 1950, however, there has been in progress a large-scale Government investment drive to bring waterpower more prominently into the scheme of electric-power production. Although the time schedules for construction have generally not been met, by 1956 the program was beginning to show results. In the course of that year alone, for example, cofferdams were thrown across four large rivers—the Ob, Angara, Kura, and Syr-Darya.[1] As a result of the year's completed construction, the total amount of new installed capacity came to 2,374,000 kilowatts. To see this magnitude in perspective, the 1956 net addition was equal to about 40 percent of the total hydropower capacity in the U. S. S. R. at the beginning of the same year.

While 1956 was, by all odds, an unusually productive year, in terms of new capacity installed, the rapidly expanding rate of hydroelectric construction is clearly evident from the general trend in the rate of installation since World War II. Whereas the average annual gain in capacity during the 5-year period 1946–50 was 400,000 kilowatts per year, additions per annum were stepped up to 560,000 kilowatts during the next 5-year period, 1951–55.

Viewing the period closer at hand, the rate of increase looms still higher. Within the past 2-year period, 1956–57, the average annual gain of hydroelectric capacity in the Soviet power network amounted to 1,500,000 kilowatts. A still higher rate of expansion is projected for the next 3 years immediately ahead. As plans stand now, hydro-

[1] R. P. Nosov, in Gideotekhnicheskoe Stroitelstvo 11, 1957, p. 23.

electric capacity is to increase at the rate of 2.4 million kilowatts per year during 1958–60. This projection must, however, be viewed in the light of past Soviet experience in regard to the fulfillment of plans in hydroelectric power construction. Fulfillment in this field of planning amounted to only 85 percent of target in the fourth 5-year plan (1946–50) and 53 percent during the fifth plan (1951–55).[2]

Highlights of the power dam program

In August 1950, the Soviet Government made public its decision to undertake the construction of several complex hydraulic installations, including two large power dams on the Volga River, at Kuibyshev and Stalingrad. The beginning of work in the same year on the latter two projects, marks the opening of the present phase in Soviet river development.

The Volga stations

Kuibyshev.—The first of the above two projects, the Kuibyshev Dam, was begun in 1950, launched into partial operation at the end of 1955, and completed in October 1957. With its completion, the Soviet Union had the largest hydroelectric station in the world, consisting of 20 power-generating units of 105,000 kilowatts each, for a total capacity of 2,100,000 kilowatts. By comparison, the installed capacity of the Grand Coulee Dam adds up to 1,900,000 kilowatts.

The second new large station on the Volga, located at Stalingrad, is still under construction, and will be somewhat larger, with a total power-generating capacity of 2,310,000 kilowatts. Although work on this power dam was also begun in 1955, none of the turbines were in operation by January 1958. The station is expected to have 22 units of 105,000 kilowatts each.

The rivers of Siberia

A major part of the present ambitious construction program embraces the principal rivers of Siberia—the Ob, Irtysh, Yenisei, and the Angara. The two star units already in the building stage in this region are: the giant Bratsk hydroelectric plant on the Angara and the still larger Krasnoyarsk station on the Yenisei River.

Bratsk.—This station has been located on the Angara River, some 3,100 miles from Moscow. Construction work was started in 1955, and the completed power dam is planned to have an aggregate capacity of 3.6 million kilowatts, supplied by 20 units of 180,000 kilowatts each.

Krasnoyarsk.—This installation is planned as the largest of all Soviet power dams, now underway with a total capacity of 4 million kilowatts. It is located on the Yenisei River near the city of Krasnoyarsk, a growing industrial center midway between Moscow and Khabarovsk on the Trans-Siberian Railroad. Each generating unit is planned to have a capacity of 286,000 kilowatts, the full station to contain a total of 14 such units.

In summing up the scope of the current construction program, a Soviet technical journal reports that at the beginning of 1957 the U. S. S. R. had in operation 120 hydroelectric stations in the state-owned network. These had a combined capacity of 8.4 million kilowatts. Another 25 stations were under construction, having a

[2] On this point see J. P. Hardt, Soviet Capacity will not Provide for Industrial Land Growth by 1960, in Electrical Engineering, November 1956, p. 2.

planned aggregate capacity of 14.3 million kilowatts.[3] The trend to large-scale installations is quite apparent from the above comparison.

Principal new power dams in the U. S. S. R.

Name of station	River	Beginning of construction	Beginning of power flow	Date of completion	Capacity
					Thousand kilowatts
Gorki	Volga	1948	1955	1956	400
Gyumush	Razdan	1948	1953	1953	224
Tsimlyansk	Don	1948	1952	1954	164
Kuibyshev	Volga	1950	1955	1957	2,100
Stalingrad	do	1950			2,300
Novosibirsk	Ob	1950	1957		400
Irkutsk	Angara	1950	1956		660
Kakhovka	Dnieper	1951	1955	1956	336
Bukhtarma	Irtysh	1953			525
Votkinsk	Kama	1954			900
Kremenchug	Dnieper	1954			450
Bratsk	Angara	1955			3,600
Saratov	Volga	1956			1,000
Dnieprodzherzinsk	Dnieper	1956			
Krasnoyarsk	Yenisei	1956			4,000

Some characteristics of the new power dams

One striking feature of the current hydroelectric development program is its increasing orientation toward the east. In this push to the eastern regions, the Soviet Government is attempting to solve two problems: (1) To add large-scale sources of low-cost power for transmission to the older industrial centers in the West; and (2) to create new power bases for future industrial development in the sparsely settled regions east of the Urals. Of these two objectives, the first is of most immediate urgency, inasmuch as the present rate of power consumption in the West is placing a heavy strain on existing facilities. Local utilization of the power to be generated by the rivers of the east is, by all accounts, still largely a matter of future investment decision. At present, power consumption on the spot is usually discussed in Soviet technical literature in terms of the potential it represents for the future erection at these sites of such power-intensive industries as aluminum, ferroalloys, synthetic rubber, fertilizers, titanium, and germanium.[4] With the addition of these remote stations, Soviet industry will certainly be in a better position to meet its nuclear energy needs.

Another conspicuous feature of the current Soviet hydroelectric program is the steadily growing size of the new stations and their generating units. Before World War II, one Soviet power expert writes—

> units of 72,000 kilowatts were considered to be the maximum feasible size. The generating units installed in the recently completed Kuibyshev station were of a capacity of 105,000 kilowatts each. Still larger units are planned for the stations nowunder way, at Bratsk (200,000 kilowatts) and at Krasnoyarsk (286,000 kilowatts).[5]

Soviet writers on this subject also call attention to the fact that domestic hydropower technique has advanced to a point where it is

[3] F. G. Loginov, in Gidrotekhnicheskoe Stroitelstvo No. 11, 1957, p. 9.
[4] A. M. Nekrasov, Electricheskie Stansii, No. 11, 1957, p. 17.
[5] V. Veits, Voprosy Ekonomiki, No. 10, 1957, p. 49.

possible to build large stations in the form of "cascades" along the same river. Thus, the Volga-Kama River system is expected eventually to have a cascade of 13 stations, of which 6 are now in use and 3 in the building stage. The Dnieper River, now supporting 2 dams, is planned to have 6 stations eventually. Multiple stations are also being built on the Irtysh, Angara, and Ob Rivers in Siberia.[6]

Still another characteristic of the current building program is the fact that the larger stations tend to be erected at points well removed from established industrial centers. This is, of course, the inevitable result of the rapid disappearance of unused water resources in the more settled industrial areas. To meet this problem, Soviet economic authorities have found it necessary to undertake the erection of extended high-tension transmission lines to carry the surplus power from the new stations to the load centers, usually farther to the west. The longest line of this type, extending 684 miles, is now being built from the site of the Stalingrad station to Moscow.[7] The Kuibyshev station higher up along the Volga has already been linked with Moscow over a distance of 535 miles by means of a high-tension line (400 kilovolts) capable of carrying, subject to some losses, 1.1 million kilowatts of electric power.[8]

The capital costs incurred in building these transmission lines, some specialists assert, can be recouped by the savings to be gained from the low cost of producing power at the new stations. Above all, the leaders of the Soviet power industry intend to use the new far-reaching transmission lines as a basis for making their strained power network more flexible, chiefly by way of improving its reserve position. Specifically, the new lines will serve to bring together the existing small regional power grids into a unified system embracing the European territory of the U. S. S. R. By 1959, this extended system is expected to encompass all the electric stations of three industrial regions, the center, south, and the Urals. Its total capacity will then add up to 25 million kilowatts and, as such, will be the largest unified power system in existence.[9]

This enlarged power system, in turn, will become a model for the grouping of the Siberian stations into a single power grid of their own. At present, however, the latter phase is placed in the rather remote future. The uses of an integrated system of all domestic power stations are usually discussed by Soviet experts from the standpoint of taking advantage of the varying peak loads within the several regions in the country. Thus, it is pointed out that the day begins and ends 5 hours earlier in Krasnoyark on the Yenissei River than in Moscow.[10]

Economic considerations

The primary economic motive behind the current intensified Soviet effort in river development is the need for more electric power. If the U. S. S. R. is to continue to expand the annual output of its industry at the present rate, roughly 65 percent every 5 years, an adequate supply of electric power must be assured in advance. More particularly, Soviet planning authorities have indicated that important national economic considerations make it necessary to enable water

[6] A. M. Nekrasov, Elektricheskie Stantsii No. 11, 1957, pp. 16–17.
[7] John P. Hardt, Dispersal of the Soviet Power Industry, Air University (April 1957) pp. 31–32. Documentary Research Study, Maxwell Air Base, Montgomery, Ala., April 1957, pp. 31–32.
[8] Loginov Gidro. Strol., No. 11, 1957, p. 8.
[9] Zhimerin, Electrichestvo, No. 11, 1957, p. 3.
[10] Veits, Voprosy Ekonomiki, No. 10, 1957, p. 53.

to play a larger part in the total output of power. The present relative output of the hydroelectric stations, namely 15 percent, must increase steadily until it reaches what is considered its optimum contribution, namely 25 percent of total power production.[11]

Hydroelectrically produced power is, furthermore, highly economical in the use of labor. As Soviet power specialists calculate it, a hydroelectric station consumes one-eighth as much manpower as is required to operate a thermopower station of comparable size. If, however, they include in this calculation the cost of mining and hauling fuel to the station, the comparable productivity of the hydroelectric stations vis-a-vis the fuel consuming station assumes a ratio of 18 to 1.[12] As it is, the scale of coal mining in the U. S. S. R. is now already quite large, 460 million metric tons per year. Moreover, labor productivity in coal mining is among the lowest in Soviet industry.

The initial labor cost involved in building each hydroelectric station, to be sure, is higher relative to thermal stations. But this excess in labor costs, according to Soviet calculations, can be recouped within the short span of 4 years.[13]

Technical improvements

One of the main deterrents to large-scale waterpower development in the past, Soviet sources indicate, had been the lack of heavy earth-moving and concrete-mixing equipment. In this regard, it is now apparent, the supply situation has increased notably, making it possible to undertake mechanized operations involving enormous volumes of earth-moving and concrete-pouring work. To cite one example, domestic production of bulldozers had reached 9,487 in 1956, whereas in 1950 the U. S. S. R. produced only 3,195 units of this type of equipment. As more heavy equipment became available, the amount of earthwork carried out yearly between 1948 and 1955 increased from 1.08 million cubic meters to 66.4 million. Furthermore, the building sites themselves are at present better supplied with electric power. The amount of power available in 1951 came to about 5.6 kilowatt-hours per worker; in 1955, the availability of power increased to 17.5 kilowatt-hours per worker.[14] Soviet hydraulic scientists have reportedly made it possible to devise a technique for pouring concrete in below freezing weather, thus enabling the projects to work the year round. While winter operations, which involve electric heating of materials, raise the cost of concrete work by some 10 to 25 percent, they nevertheless increase the year's output by 30 to 35 percent and permit the use of labor, equipment, and transport on a continuing basis.[15]

Difficulties encountered

It is quite evident from the Soviet literature that the engineers, scientists, and economic authorities of the U. S. S. R. are continuing to wrestle with some serious problems in this field. One of the technical difficulties cited is that the more important rivers of the country flow across flat terrain and are characterized by sandy or swampy bottoms, a fact that makes them incapable of supporting the heavy complex installations required for hydroelectric stations without additional reinforcements.[16]

[11] Gidro. Stroi., No. 11, 1957, p. 37. (Approximately the same rate as in the United States.)
[12] Ibid., p. 33.
[13] Ibid.
[14] Gidro. Stroi., No. 11, p. 22.
[15] Ibid., p. 13.
[16] Zhimerin, Electrichestvo No. 11, 1957, p. 4.

One complaint frequently heard, in the general and technical press alike, is against the undue length of the construction period. Soviet authorities generally agree that the record to date is too full of overextended schedules. As examples they cite the fact that the Gorki station on the Volga (400,000 kilowatts) was in construction 8 years before it began to turn out its first power. The Mingechaur Dam on the Kura River (360,000 kilowatts) took 9 years to put into operation. The Stalingrad station, commenced in 1950, has now also entered its ninth year without having produced any power to date. One prominent Soviet official in this field advances the interesting explanation that the slow pace of construction at the projects is chiefly due to the deliberately retarded rate at which such construction work is financed from the center.[17] Much remains to be done in the future, he indicates, to speed up the financing and bring the construction schedules of Soviet hydroelectric stations, especially tunneling work, up to world standards. He also suggested that Soviet engineers could profitably study some of the foreign techniques in building smaller and simplified types of dams.

Another shortcoming in current Soviet practice in this field seems to be the overemphasis upon giant models of earth-moving machines. The manufacture of small, maneuverable machines is generally overlooked, with the result that the project engineer is forced to fall back on hand labor and all this implies in regard to schedule meeting and the total cost of construction.[18]

ADDED IRRIGATION FACILITIES

The area of irrigated lands in the Soviet Union amounted to 27 million acres in 1956, or less than 6 percent of the country's total sown acreage. Existing facilities for irrigation are generally considered by Soviet soil specialists to be "inadequate in relation to the needs of the country's dryland regions."[19] A notable improvement in this regard is, however, expected as an outgrowth of the present program of river development. The area of irrigated land is expected to expand materially in view of the fact that the major hydroelectric installations now under construction are planned to include sizable artificial storage basins and irrigation canals.[20]

Some current activities

The Kakhovka station on the Dnieper, located in a semiarid region, will be equipped with facilities for irrigating some 2.7 million hectares (6.7 million acres) of land in the southern Ukraine and in northern Crimea. The cost of providing for the irrigation facilities for this station, according to one expert, will come to 180 million rubles during the first stage and eventually to a figure of 2 billion rubles (500 million at the official exchange rate).

The Mingechaur station (Kura River), has been provided with a storage basin capable of irrigating 1 million hectares (2.5 million acres) of nearby agricultural acreage. Use of the basin's water for irrigation began in 1956.[21]

A number of irrigation canals are now under construction in the semiarid regions of the country, in particular through the southeastern

[17] Nosov, Gidro. Strol., No. 11, 1957, p. 17.
[18] Ibid., p. 23.
[19] A. Askochenski, Selskoe Khoziastvo, December 10, 1957.
[20] Irrigation facilities are provided for at the following new dams: Kuibyshev, Stalingrad, Tsimliansk, Kakhovka, Farkhad, Kairak-Kum, Mingechaur, etc.
[21] Nosov, op. cit., p. 21.

zone of European Russia, including sizable areas in the provinces of Saratov, Stalingrad, Kuibyshev, Orenburg, extending to West Kazakhstan.

The largest of the irrigation projects, the Kara-Kum canal, now being built in subtropical Central Asia, will irrigate and restore to use an area of 300,000 hectares (750,000 acres) of virgin land in the so-called Hungry Steppe.[22] By devoting this land to cotton, the Soviet Government expects to increase the present cotton acreage by 14.3 percent.

New techniques used by Soviet engineers, according to the press, now make it possible to raise irrigation waters to considerable heights. For example, the irrigation canal of the upper Ingulets River, fed by the Kakhovka Reservoir, receives 30 cubic meters of water per second by means of a pumping station which lifts the water to a height of 65 meters.[23]

By contrast, the older installations along the irrigation networks of the U. S. S. R. are considered badly in need of modernization. For the most part, the present canal beds are unpaved, and standards of operating efficiency are quite low. For normal operation in this sphere, there is a lack of small sectional units needed for leveling and grading the areas to be irrigated, or for building the necessary roadways in these vicinities.[23]

On the research side, irrigation activities in the U. S. S. R. are reported to have the support of 18 Government project planning bureaus and 14 research institutes. In the field, there are at present a total of 65 Government-owned machine-and-excavator stations and 174 machine-and-melioration stations engaged full time in irrigation work.[23]

Improved Navigation Routes

Inland water transport has been traditionally a lagging sector in the Soviet freight shipping system. Throughout its history the Soviet Government has found its investments in the expansion of railway facilities far more productive of dependable transport capacity than in any other means of shipment. Under the circumstances, therefore, the country's industrial shippers, for their part, have come to rely primarily on the railroads as the most dependable means for solving their freight problems. This may be illustrated by two figures: Between 1913 and 1956 the volume of freight carried by the railways increased sixteenfold, while river freight traffic rose only 2.5 times. As a result, the railways now account for 83 percent of all freight shipments; the rivers, for 5.4 percent.

In the main, the problem is one of geography. Soviet freight traffic is largely an east to west movement, while the major Soviet rivers, with the exception of the Amur in the far east, run north and south. Then, too, the winter freeze on many of the rivers lasts for a better part of the year; and several of the large Siberian rivers empty into the Arctic seas along the uninhabited northern coastal lands of the U. S. S. R.

To date, river transport is still described in the Soviet technical press as "lagging in the tempo of introducing new technology behind other forms of transportation, especially behind the railroads."[24]

There is in evidence, however, the beginning of an effort on the part of Soviet economic authorities to exploit the inland waterways

[22] Askochenski, Selskoe Khoziaistvo, December 10, 1957.
[23] Ibid.
[24] Vodnyi Transport, November 19, 1957.

more intensively for the job of hauling freight. This effort seems to be focused especially on the European part of the U. S. S. R., where the rivers can function more effectively in handling the traffic movement between north and south. Above all, such an increase in the use of water routes is described as necessary to relieve the heavy load carried by the railways across areas where adequate waterways exist. Most immediately, Soviet transport officials maintain, the rivers could be engaged more actively in the interregional exchange of bulk freight within the European part of Russia—timber, coal, oil, metal, grain, and building materials.

The present effort at increasing the role of river transport seems to follow along two main directions: First, Soviet authorities are moving to utilize the hydroelectric installations now in construction on some of the large rivers of the U. S. S. R. for the purpose of expanding and streamlining river navigation. Second, there is underway an active undertaking to improve the existing through water route from the Volga to the Baltic Sea.

Work on the latter project was begun in August 1957. It involves the immense task of modernizing the old shallow-draft Marinski Canal system, linking the Volga with the Baltic Sea along the waterways of northwestern Russia. This will provide continuous water passage between the north and south within Europe, since the Volga, in turn, now connects with the Black Sea via the capacious Volga-Don Canal, completed in 1952. The reconstruction of the Volga-Baltic Canal system is expected to be completed by 1960.[25]

The new hydroelectric stations are expected to make a significant contribution to through river navigation. The storage basins built up along the Kama and Volga, for example, will help provide a continuous waterway, free of seasonal shallows. The capital investment value of this improvement has been calculated at 6 billion rubles ($1.5 billion).[26]

Other projects now in construction are designed to make better commercial use of the expensive Volga-Don Canal by the building of a new river port at Ust-Donets in the Ukraine. This will help handle an increased inflow of timber and a larger movement of coal out of the local mining area.

With the improvement in navigation facilities along some of the important rivers and canals in Europe, Soviet transport planners expect to be able to move more bulk goods by way of mixed water-and-rail routes, and thereby both reduce the cost of freight and relieve the overburdened railways.

The cost of the program

The farflung river development program now in progress in the U. S. S. R. is financed from the center by the All-Union Government, through the state budget. As far as can be determined, no official estimate has been published on the cost of the program as a whole. Only a few current expenditure figures, on an annual basis, are available.

Thus, the Soviet Government reported to the Economic Commission in Europe in 1956 that for the preceding year its investments in the construction of electric power facilities were as follows (in millions of rubles): [27]

[25] Ibid.
[26] Gid. Strol., p. 36.
[27] E. C. E. (U. N.), The Electric Power Situation in Europe in 1955. Geneva, 1957, p. 57.

Power development, total	12, 121
Thermal plants	3, 757
Hydro plants	6, 514
Power systems	884

(Power development as percent of total investments, 6.3 percent.)

It is worthy of note that expenditures on waterpower stations in 1955 were 75 percent larger than on thermal stations, and that capital outlay on hydropower development amounted to 4 percent of all new investments in the national economy in the course of that year.

A recent Soviet publication reports that the cost of construction and equipment of hydropower station in 1956 came to a figure of 8.4 billion rubles (5 percent of total investments for that year).[28]

The outlays reported above are presumed to cover all phases of river development, including irrigation and the improvement of facilities for navigation and fishing. Under present practice, the entire capital cost is borne by the electric power industry. This, in the opinion of one Soviet expert, is an undesirable arrangement, because the specifications for nonpower facilities, which in his calculation ranges between 23 and 45 percent of the total capital outlay on existing projects, are made by the respective economic agencies, who make extreme demands on the power industry, often without regard to the costs involved.[29]

One specific conclusion which emerges from reading the current Soviet literature on the subject is that the Soviet leadership is interested in the magnitude of the economic cost of the river development program to the extent of assessing this cost against the total needs of national power. They are not too concerned with determining its cost relative to thermal power. The veteran Soviet planner, G. M. Krzhizhanovski, a survivor of the small circle of planners who began their service under Lenin, is openly contemptuous of the calculating experts who weigh the pros and cons of hydroelectric development in terms of relative ruble costs only. These "shortsighted specialists," he complains, "are incapable of understanding the exceptional national economic and defense significance of our hydroelectric construction." [30]

More generally, recent events in this sector of the Soviet economy suggest that the turning point in the direction of a more active approach to river development came within the current decade, prompted by an improved position in investment resources and an easier supply of equipment for modern, mechanized operations. It seems evident, furthermore, that the impetus for undertaking and sustaining this ambitious construction program comes primarily from the politically oriented leadership on the central planning level rather than from the technical experts concerned with the needs of industry for electric power. The latter still seem to find it difficult to shed "their conviction of some sort of special advantage possessed by the thermal stations over power dams."[31] For the leadership, however, the grandiose river projects have the unique added attraction of serving as concrete symbols of economic progress whereby the interest and hopes of the population could be engaged in support of the policies and objectives of the regime.

[28] Yezhegodnik Bolshoi Sovetskoi Entsiklopedii, 1957, p. 50.
[29] Nosov, op. cit., p. 20.
[30] G. M. Krzhizhanovski, Electrichestvo No. 11, 1957, p. 5.
[31] Zhimerin, op. cit., p. 5.

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